

Listing of the Claims

Claim 1. (Currently Amended): A chemical vapor deposited, freestanding β phase polycrystalline silicon carbide having a thermal conductivity of at least 375 W/mK and a crystalline order ratio of less than about 0.10.

Claim 2. (Original): The silicon carbide of claim 1, wherein the thermal conductivity ranges from about 375 W/mK to about 390 W/mK.

Claim 3. (Original): The silicon carbide of claim 2, wherein the thermal conductivity is less than about 389 W/mK.

Claim 4. (Canceled)

Claim 5. (Original): A chemical vapor deposited, freestanding β phase polycrystalline silicon carbide comprising a crystalline order ratio of less than about 0.10.

Claim 6. (Original): The silicon carbide of claim 5, wherein the crystalline order ratio is from about 0.05 to about 0.01.

Claim 7. (Original): A method of preparing a β phase polycrystalline silicon carbide having a high thermal conductivity and low stacking faults comprising:

- a) placing at least one mandrel in a chemical vapor deposition chamber such that the at least one mandrel is orientated in the deposition chamber such that a flow of reactants in the deposition chamber is parallel to a surface of the at least one mandrel;
- b) generating the reactants into the deposition chamber as gases such that the reactants form silicon carbide in the deposition chamber;
- c) maintaining a deposition chamber temperature of greater than 1350° C to about 1450° C; and
- d) depositing the silicon carbide on the surface of the at least one mandrel at a rate of from about 0.1 $\mu\text{m}/\text{min.}$ to about 3.0 $\mu\text{m}/\text{min.}$ to form a silicon carbide having a thermal conductivity of at least about 375 W/mK.

Claim 8. (Original): The method of claim 7, wherein the silicon carbide is deposited on the surface of the at least one mandrel at a rate of about 1.5 $\mu\text{m}/\text{min}$.

Claim 9. (Original): The method of claim 7, wherein the reactants comprise hydrogen gas and methyltrichlorosilane.

Claim 10. (Original): The method of claim 9, wherein a flow rate of hydrogen gas is from about 55 to about 75 slpm, and a flow rate of methyltrichlorosilane is from about 10 to about 15 slpm.

Claim 11. (Original): The method of claim 9, wherein a hydrogen gas/methyltrichlorosilane gas partial pressure flow rate is from about 4 to about 10.

Claim 12. (Original): The method of claim 7, wherein the deposition chamber has a pressure of from about 100 to about 300 torr.

Claim 13. (Original): The method of claim 7, wherein the at least one mandrel has a temperature of from about 1355° C to about 1370° C.

Claim 14. (Original): The method of claim 7, wherein the silicon carbide has a thermal conductivity of from about 375 W/mK to about 390 W/mK.

Claim 15. (Original): The method of claim 7, wherein a crystalline order ratio of the silicon carbide is less than about 0.10.

Claim 16. (Original): The method of claim 15, wherein the crystalline order ratio is from about 0.05 to about 0.01.

Claim 17. (Original): The method of claim 7, wherein the silicon carbide is deposited on the mandrel between about 50 cm and 140 cm from a gas reactant source in the deposition chamber.

Claim 18. (Original): A method of preparing a β phase polycrystalline silicon carbide having a high thermal conductivity and low stacking faults comprising:

- a) placing at least one mandrel in a chemical vapor deposition chamber such that gas reactants flow parallel to a surface of the at least one mandrel;

- b) generating gas reactants composed of hydrogen gas and methyltrichlorosilane gas in the deposition chamber, a flow rate of the hydrogen gas is about 67 slpm and a flow rate of the methyltrichlorosilane gas is about 11 slpm;
- c) maintaining the deposition chamber temperature of about 1355° C, and the deposition chamber pressure at about 200 torr throughout the deposition method; and
- d) depositing silicon carbide on the surface of the at least one mandrel at a deposition rate of about 0.5 $\mu\text{m}/\text{min.}$, the silicon carbide having a thermal conductivity of at least about 375 W/mK and a crystalline order ratio of less than 0.10.

Claim 19. (Original): The method of claim 18, wherein a gas partial pressure flow ratio of hydrogen/methyltrichlorosilane is about 6.0.

Claim 20. (Original): The method of claim 18, wherein the silicon carbide is deposited on the surface of the at least one mandrel between 50 cm to about 140 cm from a gas reactant source in the deposition chamber.

Claim 21. (Original): The method of claim 18, wherein the silicon carbide has a thermal conductivity of from about 375 W/mK to about 390 W/mK.

Claim 22. (Original): The method of claim 18, wherein the silicon carbide has a crystalline order ratio is from about 0.05 to about 0.010.